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13. SUPPLEMENTARY NOTES

14. ABSTRACT

During the production of a filter housing for the Naval Sea Systems Command (NAVSEA), Hamill Manufacturing Company, Trafford, Pa., was required to drill a 5.5"-dia., 21.5"-deep hole in a block of 1020 steel. The operation consumed excessive time and tooling. It took 63 minutes and four drills -- in spot, 3.0", 5.0", and 5.5" diameters -- to complete the hole. Chip control was an additional problem, frequently making it necessary to retract the drills in mid-cut to clear out the unwieldy mild steel chips. NAVSEA asked if the National Center for Defense Manufacturing & Machining (NCDMM) could provide a solution to reduce machining time and improve chip control.

15. SUBJECT TERMS
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NAVSEA Aircraft Carrier Filter Housing

NCDMM Project No. 04-0030-01

Technical Report

PROBLEM / OBJECTIVE

During the production of a filter housing for the Naval Sea Systems Command (NAVSEA), Hamill Manufacturing Company, Trafford, Pa., was required to drill a 5.5"-dia., 21.5"-deep hole in a block of 1020 steel. The operation consumed excessive time and tooling. It took 63 minutes and four drills -- in spot, 3.0", 5.0", and 5.5" diameters -- to complete the hole. Chip control was an additional problem, frequently making it necessary to retract the drills in mid-cut to clear out the unwieldy mild steel chips. NAVSEA asked if the National Center for Defense Manufacturing & Machining (NCDMM) could provide a solution to reduce machining time and improve chip control.

Deep-hole drill with similar component

ACCOMPLISHMENTS / PAYOFF

Process Improvement

NCDMM suggested application of a 5.5"-dia. deep-hole drilling system that featured a coated carbide pilot drill flanked by two flutes tooled with a total of four indexable carbide cutting inserts. The inserts had titanium-nitride coating for wear resistance, and an advanced chip control geometry. Internal passages in the drill body delivered coolant directly to the cutting edge/workpiece interface.

Implementation and Technology Transfer

The drilling system was implemented on a horizontal machining center with coolant supplied at 100-200 pounds per square inch (psi), in volume adequate to facilitate chip removal. Effective chip control made it unnecessary to withdraw the drill to clear chips, and the new tooling completed the hole in a single pass.

Through the elimination of multiple drills and repeated retractions, drilling time dropped 65 percent, to 22 minutes. Smoother cutting action and reliable chip removal improved hole roundness, tolerances, and surface finish.

The Hamill shop manager said, "The drilling system and parameters allowed me to machine this part with much better accuracy and finish. The parameters were within the horsepower and torque limits of my machining center. The successful implementation of this drill on the first try went a long way in building confidence with my operators."

Expected Benefits

Implementation resulted in:

- Reduced machining time from 63 min. to 22 min.
- Reduction of tooling required 75%
- Improved chip control 100%
- Capable of producing required hole finish and maintaining hole quality with one tool

Yearly savings for a 240-unit annual production run exceed $10,920 from machine time savings alone. Further savings accrue from reduced tool (insert) replacement costs, lower setup times, and reduced scrap rate. Savings resulting from the implementation of this technology will ultimately rise to $75,000 annually and total $375,000 over a five-year period.

TIME LINE / MILESTONE

Start Date.....Jan 04
Implemented ..... End Jan 04

PROJECT FUNDING

NCDMM funding .....<$1K

PARTICIPANTS

NCDMM
Naval Sea Systems Command (NAVSEA)
Hamill Manufacturing Company

For additional information concerning this project, contact the NCDMM at www.ncdmm.org